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## Chapter Seven

# CONSTRUCTION COST ESTIMATES

Chapter Five presents the Department's procedures for the preparation of quantity summaries. These quantities are used by the Department and contractors to determine the cost for construction of the project. Chapter Seven provides information on the various preconstruction cost estimates required during project development and the procedures for developing these estimates.

### 7.1 PROJECT ESTIMATES

During project development, several cost estimates are prepared to determine and refine the expected project construction costs. These estimates are used by the Rail, Transit and Planning Division to ensure that sufficient funds are available for construction. The following presents the various cost estimates that are prepared during project development and who is responsible for preparing each estimate. Figure 7.1A provides the recommended distribution list for each of these cost estimates. Cost estimates are developed at the following project stages:

1. Project Programming. The District Office is responsible for nominating projects to be included on the Department's Program of Projects. When the District Office submits these nominations, they are also required to submit a rough cost estimate for project construction. This estimate is typically determined using a cost per kilometer of roadway based on similar, recent projects in the area. Unless they can be reasonably and quickly calculated, individual quantities are typically not used.
2. Alignment and Grade Review. The designer is responsible for determining the first detailed construction cost estimate at this stage of project development. Do not use the initial project estimate developed by the District Office but, instead, develop a new estimate based on the latest available information. This estimate should be determined using the following:
  - a. Grading and Surfacing. The designer should develop a rough estimate of summaries for grading and surfacing. Use the Average Bid Prices to determine the unit prices for the various items.

Distribution	Programming Project	Alignment and Grade Review	Project Scope Changes	Plan-in-Hand	Final Review	Designer's Final Estimate
Rail, Transit and Planning Division	X	X	X			X
District Administrator(s)	X	X	X	X	X	X
Engineering Management Section — Engineering Division	X	X	X	X	X	X
Contract Plans Section						X
Secondary Roads Engineer — (STPS Projects Only)	X	X	X	X	X	X
Urban Section — (Urban Projects Only)			X	X	X	X
Project Files	x	X	X	X	X	X

COST ESTIMATE DISTRIBUTION

Figure 7.1A

- b. Bridges. The designer should contact the Bridge Bureau to determine the estimated cost for large bridges within the project limits. These estimates are typically based on the m<sup>2</sup> of bridge surface.
  - c. Permanent Traffic Control Devices. The Traffic Engineering Section will only be responsible for providing a preliminary estimate if special elements such as signalization or extensive lighting are included in the project.
  - d. Drainage. The designer is responsible for determining the cost for drainage elements on the project. This cost is typically determined assuming a percentage of the grading and surfacing quantities. This percentage is based on similar projects recently completed in the area.
  - e. Other Elements. The costs for most other elements on the project are determined using a percentage of the total cost for all other elements listed in Comments 2a. through 2d. This percentage is determined using similar projects recently completed in the area.
3. Scope-of-Work Report. If a project does not have an Alignment and Grade Review, the first construction cost estimate will be developed by the designer for the Scope-of-Work Report. Prepare this estimate in a similar manner as discussed in Comment #2 for the Alignment and Grade Review. If an estimate was prepared for the Alignment and Grade Review, it will generally not be necessary to update the estimate for the Scope-of-Work Report.
4. Plan-in-Hand. The designer is responsible for updating the Alignment and Grade Review or Scope-of-Work Report construction cost estimate for the Plan-in-Hand. At this stage of project development, the majority of the project quantities should be available. Section 7.2 describes the procedure that should be used to develop the cost estimate based on these project quantities. The Bridge Bureau and the Traffic Engineering Section will be responsible for providing the road designer with their cost estimates for bridge elements and permanent traffic control devices (e.g., signing, pavement markings, lighting, signalization), respectively.
5. Final Review. The construction cost estimate for the Final Review generally will only need to be an update of the estimate from the Plan-in-Hand. The Bridge Bureau and the Traffic Engineering Section should provide the road designer with their updated cost estimates for bridge elements and permanent traffic control devices on the project.

6. Project Scope Changes. Whenever the scope of the project changes, the designer will be responsible for determining a new construction cost estimate. Estimates for scope of work changes are typically based on general quantities and are determined as discussed in Comment #2.
7. Final Check. The Plan Checker will review the designer's final estimate. The designer will request the District to submit the final quantities and unit prices for temporary traffic control devices prior to submitting the project to the Plan Checker.
8. Engineer's Estimate. The Engineer's Estimate is developed by using the final estimates from the various Sections and Bureaus involved with the project. The Contract Plans Section will be responsible for collecting and distributing to the Board of Review the various units' final cost estimates. The Board of Review includes representatives from the Construction Bureau, Road Design Section, Pavement Design Section and Contract Plans Section. The Board of Review will review and adjust the major bid item prices as deemed necessary. These items typically may include excavation, aggregate surfacing, plant mix surfacing, asphalt milling, erosion control, mobilization and miscellaneous work. The Contract Plans Section will review all other bid prices and prepare the Engineer's Estimate.

## 7.2 ESTIMATING PROCEDURES

When preparing a detailed cost estimate for the Plan-in-Hand or later estimates, the designer should note the following:

1. Funding Splits. Some projects may have two or more funding sources. For example, where bridges comprise a substantial percentage of the total project, they may be funded separately under their own project coding. For these types of projects, separate cost estimates are required for each funding source based on the quantities within that particular funding source. The locations of the funding splits will be provided to the designer by the Fiscal Program Section.
2. Estimate Form. The Department has developed two estimating forms that the designer should use to determine the construction cost estimate — a manual form and a computer program. Desirably, the computer program will be used. The computer program was developed using Excel. A copy of this program and instructions on how to use it are provided in each of the design units, or a copy can be obtained from the Road Design Section. Where manual calculations are used to determine the construction cost estimate, use the form included at the end of this chapter.
3. Quantities. Show all project quantity estimates on the Summary Sheets within the contract plans. These totals from the appropriate summary frames are used in determining the cost estimate. Note that some summary frame totals are added to other frames (e.g., Additional Surfacing Frame totals are added to the Surfacing Frame). Therefore, the designer must be careful not to double count these quantities. Some items may have quantities shown in more than one frame. Combine these quantities when computing the cost estimate. See Chapter Five for information on how to develop quantity summaries.
4. Unit Prices. List the quantity items from the Summary Sheets and the appropriate average bid unit prices on the estimate form. The average bid unit prices are provided by the Contract Plans Section twice a year. The designer will then submit the estimate form to the District for their review. The District will incorporate their recommended unit prices on the estimate form. The District's review of similar projects should be used to aid in determining the adjusted unit prices.
5. Inflation Factors. Adjust all estimates by an annual inflation factor. Apply the inflation factor using the following formula:

$$\text{Adjusted Estimate} = (\text{Estimate}) \times (1+i)^n$$

Where:        i        =        inflation factor

              n        =        the number of years from the time the estimate is  
   prepared to the project ready date

The inflation factor is provided by the Engineering Management Section.

6. Quantity Descriptions. Only use the quantity description as provided in the average bid unit prices for the quantity description on the estimate form.
7. Lump-Sum Items. Desirably, do not use lump-sum items on a project. However, this is not always practical. Where necessary, only use lump-sum bid items where the scope of work for the item is clearly defined and the amount of work has a minimal chance of changing during construction. Section 5.5.1 provides additional information on how to treat lump-sum items. In determining the unit price for lump-sum items, consider the following:
  - a. Mobilization. Estimate mobilization using 10 percent of total roadway construction items (e.g., grading, surfacing, fencing, drainage). This percentage is exclusive of the other design elements which are calculated by other units (e.g., traffic control devices, bridge structures).
  - b. Traffic Control. A percentage is used for the preliminary estimates for traffic control until quantities for units of traffic control are established by the District in the final estimate. The final traffic control quantities provided by the District will include separate items for hours of pilot car and hours of flagging. List these items separately on the estimate sheet.
  - c. Other Items. Most lump-sum bid items can be divided into individual parts for estimating purposes. For example, clearing and grubbing can be divided into the number of hectares cleared or the size and number of trees to be removed. For removal of structures, the cost can be determined based on the m<sup>2</sup> of structures on other projects. Once the elements have been segregated, the designer uses engineering judgment to determine the appropriate cost for the lump-sum bid item on the project.
8. Contingencies and Construction Engineering. When developing the detailed cost estimate, assume a cost for construction contingencies and construction engineering. Calculate contingencies assuming a percentage of all construction items, including bridge items, traffic control devices, etc. The percentage should



decrease as the project develops and the quantities become more certain. Use a 15 percent contingency for the initial estimate. Reduce this percentage for the other preliminary estimates and use a 5 percent contingency for the final estimate. Contingencies are not to be used to account for inflation. Calculate construction engineering assuming 10 percent of all construction items, excluding the contingency amount. The Board of Review will set the final construction engineering cost.

9. Approval and Distribution. All construction cost estimates prepared by the designer must be approved by the design supervisor. A final estimate must be included with the contract documents when the plans are forwarded to the Contract Plans Sections. Include copies of the cost estimate to those units or individuals as shown in Figure 7.1A and to the project files.

